

REMARKS

Applicants have amended their claims in order to further define various aspects of the present invention. Specifically, claim 1 has been amended to further clarify that the ditrimethylolpropane recovered in the recited process is ditrimethylolpropane which is by-produced when producing trimethylolpropane by reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst, and then separating trimethylolpropane by extraction and distillation, the ditrimethylolpropane recovered in the claimed process being obtained by subjecting the formal compound contained in a still residue of the above-referred-to distillation to acid decomposition, and, thereafter, recovering ditrimethylolpropane from the still residue. Claim 4 has been amended to recite that the process (for recovering ditrimethylolpropane) includes subjecting the still residue to acid decomposition of the formal compound; removing high-boiling components having a higher boiling point than that of the ditrimethylolpropane by distillation from the still residue; and subjecting resulting products after removing the high-boiling components, to crystallization using a solvent. Claim 6 has been amended to recite that the high-boiling components are removed prior to subjecting the formal compound to the acid decomposition; and to further clarify that the resultant product from the acid decomposition is subjected to the crystallization. And claim 8 has been amended to provide antecedent basis for the resultant crystallized product.

In addition, subject matter of claim 10 has been incorporated into claim 9, with claim 9 being further amended to clarify that the process is a process for recovering ditrimethylolpropane by-produced when producing trimethylolpropane by a recited process of reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst, and then separating trimethylolpropane by extraction and distillation, and with the process for recovering ditrimethylolpropane recovering the ditrimethylolpropane from a still residue of the aforementioned distillation, by specified steps.

Moreover, Applicants are adding new claims 12-17 to the application. Claim 12, dependent on claim 1, recites that high-boiling components having a higher boiling point than that of ditrimethylolpropane are removed from the still residue prior to subjecting the still residue to the acid decomposition. Claim 14 corresponds to claim 4, but recites that the resulting products after removing the high-boiling components are subjected to distillation (rather than crystallization). Claims 13 and 16, dependent respectively on claims 4 and 14, each recites that the high-boiling components having a higher boiling point than that of ditrimethylolpropane are removed from the still residue after the acid decomposition. Claim 15, dependent on claim 14, recites the further step of performing crystallization, using a solvent, after the removal of the low-boiling components by distillation. Claims 17 and 18, dependent respectively on claims 1 and 9, respectively recites that the still residue, after the acid

decomposition, is subjected to neutralization; and recites that the resultant product (after removing the high-boiling components) contains substantially no bis-trimethylolpropane, and that the solvent used in the crystallization is an organic solvent. Note, for example, pages 2-12 of Applicants' specification.

Applicants respectfully traverse the rejection of their claims under the second paragraph of 35 USC 112, as set forth on pages 2 and 3 of the Office Action mailed January 3, 2002, particularly insofar as applicable to the claims are presently amended. Thus, claim 1 recites a process for recovering ditrimethylolpropane, by-produced when producing trimethylolpropane by a specific reaction procedure, with the trimethylolpropane being separated by, inter alia, distillation, and with the process for recovering ditrimethylolpropane, of claim 1, including a step of subjecting a formal compound contained in a still residue of the aforementioned distillation to acid decomposition, and then recovering the ditrimethylolpropane. It is respectfully submitted that claim 1, as presently amended, clearly recites a process for recovering ditrimethylolpropane, and includes specific steps of treating a residue including the ditrimethylolpropane by-produced, with the recited procedure for by-production of the ditrimethylolpropane not forming part of the recited process but forming a basis thereof. It is respectfully submitted that claim 1 is clear, with respect to the process being recited therein.

Similarly, claim 9 has been amended to recite a process for recovering

ditrimethylolpropane, by-produced when producing trimethylolpropane by a specific reaction procedure, the process for recovering ditrimethylolpropane including recovering the ditrimethylolpropane from a still residue of the distillation, and further defines specific steps of the process for recovering ditrimethylolpropane. It is respectfully submitted that claim 9 is clear, with respect to the process being claimed therein.

In view of the foregoing, it is respectfully submitted that each of claims 1 and 9 is clear with respect to the process being claimed, sufficiently to satisfy the requirements of 35 USC 112, second paragraph.

The contention by the Examiner that the preambles of claims 1 and 9 recite a process for recovering ditrimethylolpropane, but that the body of each claim does not recite a recovery process, is respectfully traversed insofar as applicable to claims 1 and 9 as presently amended. That is, in the processing steps recited in claim 1, the last step is recovering ditrimethylolpropane from the still residue; moreover, claim 9 recites that the process for recovering ditrimethylolpropane recovers the ditrimethylolpropane from a still residue of the distillation, with the recovering being further defined. Clearly, each of claims 1 and 9 recite a recovery process of the ditrimethylolpropane.

Applicants respectfully traverse the conclusion by the Examiner that the subject matter of claim 4 is already in claim 1, particularly insofar as applicable to claim 4 as presently amended. Thus, claim 4 defines specific processing

steps in e.g., claim 1, and also additional processing steps. It is respectfully submitted that the steps as a whole in claim 4 further define the subject matter of claim 1, such that the subject matter of claim 4 is not redundant, with respect to claim 1.

Applicants have amended claim 4 such that it is clear that the resultant products referred to in step (iii) of claim 4 is the resultant products of step ii); accordingly, the basis for the indefiniteness rejection as set forth in Item d on page 3 of the Office Action mailed January 3, 2002, is moot.

Applicants respectfully traverse the conclusion by the Examiner that claim 4i) and iii), and claim 1, appear to be at odds with one another as to the matter of treating the still residue. That is, claim 4 recites a step of subjecting the still residue to the acid decomposition of the formal compound, consistent with the first processing step in claim 1; and recites additional processing, providing recovery of the ditrimethylolpropane from the still residue. It is respectfully submitted that the processing steps in claims 1 and 4 are consistent with each other, in providing recovery of the ditrimethylolpropane.

Contentions by the Examiner as to a lack of proper antecedent basis, in Item f on page 3 of the Office Action mailed January 3, 2002, are respectfully traversed, especially insofar as applicable to the claims as presently amended. Thus, claim 6 now recites that prior to subjecting the formal compound to the acid decomposition, high-boiling components having a higher boiling point

than that of ditrimethylolpropane are removed from the still residue, with resultant product from the acid decomposition being subjected to crystallization using a solvent. Thus, there is now no need for antecedent reference to removal of the high-boiling components, such removal being recited in claim 6.

Moreover, claim 8 has now been amended to recite that the still residue is first subjected to crystallization using a solvent and then the formal compound is subjected to the acid decomposition, positively reciting the initial crystallization step and avoiding any need for antecedent recitation thereof; in addition, claim 8 has been amended to delete the word "the" in connection with the resultant reaction mixture, and it is respectfully submitted that claim 8 is now clear that this reaction mixture is the mixture obtained from the acid decomposition.

Applicants respectfully traverse the conclusion by the Examiner in Item g on page 3 of the Office Action mailed January 3, 2002, that claim 8 is at odds with claim 1, the claim from which it depends. That is, claim 1 recites a step of subjecting a formal compound to acid decomposition; on the other hand, claim 8 recites that after a crystallization step, the formal compound contained in the resultant crystallized product is subjected to the acid decomposition. It is respectfully submitted that there is no inconsistency in claim 8, reciting an initial crystallization with the acid decomposition following, and claim 1, reciting the acid decomposition without reciting an initial processing step. It is

respectfully submitted that there is no inconsistency between claims 1 and 8, but that claim 8 further defines the processing of claim 1, defining, for example, an additional processing step.

As can be seen in the foregoing, as well as from the amendments to the claims, Applicants have extensively amended the previously considered claims in a bona fide attempt to overcome all issues raised by the Examiner under the second paragraph of 35 USC 112. If the Examiner is of the opinion that any issues remain under the second paragraph of 35 USC 112, it is respectfully requested that the Examiner contact the undersigned, for working out appropriate language for overcoming any remaining issues. The Examiner is thanked in advance for complying with this request.

Applicants respectfully submit that all of the claims now presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in the Office Action mailed January 3, 2002, that is, the teachings of Japanese Patent Document No. Showa 49 (1974)-133311, described in the first full paragraph on page 2 of Applicants' specification, and SU1006425, under the provisions of 35 USC 103.

Initially, Applicants thank the Examiner for the indication that the subject matter of claims 2-8 and 10 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims; and, moreover, upon overcoming the indefiniteness

rejections. In view of the present amendments to, e.g., claim 1, and the following comments, it is respectfully submitted that claim 1 and claims dependent thereon (that is, claims 2-8) should now be allowed.

Moreover, Applicants have incorporated subject matter of claim 10 into claim 9; accordingly, it is respectfully submitted that rejection of claims 9 and 11 as set forth on page 4 of the Office Action mailed January 3, 2002, is moot. Accordingly, no further discussion of this rejection, including the reference applied by the Examiner therein, is necessary.

In connection with the subject matter of claim 1, as noted, for example, on pages 2 and 3 of Applicants' specification, Applicants have found that by decomposing a straight-chain formal compound produced by the reaction between two molecules of trimethylolpropane and formaldehyde contained in the still residue, e.g., bis-trimethylolpropane, the ditrimethylolpropane of the still residue can easily be removed in purified form from the still residue, achieving objectives according to the present invention. Note also the last paragraph on page 4 of Applicants' specification, showing the ditrimethylolpropane which is the desired purified product according to the present invention, and the bis-trimethylolpropane. Note also the paragraph bridging pages 10 and 11, and first full paragraph on page 11, of Applicants' specification.

SU1006425 (note the abstract thereof) discloses concentrated aqueous

formaldehyde prepared by working up aqueous formaldehyde solutions with an aliphatic alcohol. The process involves contacting 1-10% formaldehyde solution with methanol in a molar ratio of 1:2 on a column filled with catalyst KU-2, and keeping specified temperatures in the distillation vessel and at the top of the column. This document discloses hydrolysis of formed formals is carried out on a second column filled with catalyst KU-2, which uses water collected in the first column, conditions in the second column being defined.

It is respectfully submitted that the disclosure of SU1006425A would have neither taught nor would have suggested steps of subjecting the formal compound contained in a still residue of the distillation utilized in separating trimethylolpropane, and recovering ditrimethylolpropane from the still residue of the distillation. It is respectfully submitted that the applied reference does not disclose, nor would have suggested, recovery of ditrimethylolpropane, according to the present invention, and it is respectfully submitted that the purpose of the reaction in the applied reference and the purpose of the present invention are very different.

The contention by the Examiner that recitations prior to the phrase "said process comprising" is deemed to be known in the art, is noted. It is respectfully submitted, however, that the steps after "the process comprising" in claim 1 refer back to the distillation, recited previously to "the process comprising". Accordingly, it is respectfully submitted that the preamble

language must be considered in determining patentability; and, clearly, the reference applied against claim 1 does not disclose, nor would have suggested, application of processing steps to a still residue of the distillation in separating trimethylolpropane by extraction and distillation, after forming the trimethylolpropane by reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst.

The undersigned notes the Information Disclosure Statement filed April 2, 2002, in the above-identified application. Consideration of the documents submitted therewith, upon further examination of the above-identified application, is respectfully requested.

In light of the foregoing comments and amendments to the claims, reconsideration and allowance of all claims remaining in the application are respectfully requested.

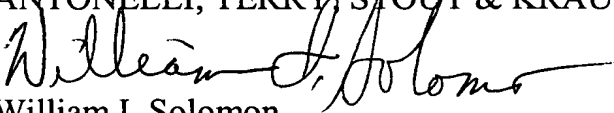
Attached hereto is a marked-up version of the changes made to the claims by the current Amendment. This marked-up version is on the attached pages, the first page of which is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

To the extent necessary, Applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with

the filing of this paper, including extension of time fees, to the Deposit Account No. 01-2135 (Case No. 396.40405X00) and please credit any excess fees to such Deposit Account.

Respectfully submitted,

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A handwritten signature in cursive script, appearing to read "William I. Solomon", written in black ink.

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VERSION WITH MARKINGS TO SHOW CHANGES MADE
IN THE CLAIMS

Please cancel claim 10 without prejudice or disclaimer, and amend the claims remaining in the application as follows:

1. (Amended) A process for recovering ditrimethylolpropane [from a still residue obtained by extracting and then distilling off trimethylolpropane from a reaction solution obtained by reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst,] by-produced when producing trimethylolpropane by reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst, and then separating trimethylolpropane by extraction and distillation, said process for recovering ditrimethylolpropane comprising:

subjecting a formal compound contained in [the] a still residue of the distillation to acid decomposition, and,
after said subjecting, recovering ditrimethylolpropane from the still residue.

4. (Amended) A process according to Claim 1, comprising the steps of:

i) subjecting [the formal compound contained in] the still residue to

~~the acid decomposition of the formal compound;~~

ii) removing high-boiling components having a higher boiling point than that of ditrimethylolpropane, ~~by distillation,~~ from the still residue; and

iii) subjecting the resultant [product] ~~products of ii)~~ to crystallization using [a] solvent.

6. (Amended) A process according to Claim 1, wherein [after the formal compound contained in a distillate obtained by removing] ~~prior to subjecting the formal compound to the acid decomposition,~~ high-boiling components having a higher boiling point than that of ditrimethylolpropane ~~are removed~~ from the still residue, [is subjected to acid decomposition, the] ~~and resultant product from the acid decomposition~~ is subjected to crystallization using a solvent.

8. (Amended) A process according to Claim 1, wherein [after] the still residue is first subjected to crystallization using a solvent, ~~to form a resultant crystallized product,~~ and then the formal compound contained in the resultant crystallized product is subjected to ~~said~~ acid decomposition; [the] ~~and resultant reaction mixture obtained from the acid decomposition~~ is subjected to crystallization.

9. (Amended) A process for recovering ditrimethylolpropane [from a still residue obtained by extracting and then distilling off] by-produced when producing trimethylolpropane [from a reaction solution obtained] by reacting n-butyraldehyde with formaldehyde in the presence of a basic catalyst, [said process] and then separating trimethylolpropane by extraction and distillation, said process for recovering ditrimethylolpropane recovering the ditrimethylolpropane from a still residue of said distillation, and being performed by steps comprising:

removing high-boiling point components having a higher boiling point than that of ditrimethylolpropane, from the still residue of said distillation by molecular distillation, thereby forming a resultant product; and

subjecting the resultant product to crystallization using a solvent.